

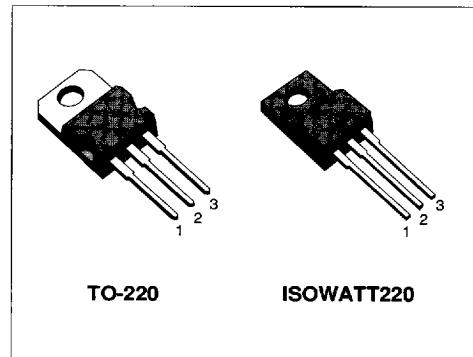
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V _{DSS}	R _{DS(on)}	I _D
STP6N50	500 V	< 1.1 Ω	6 A
STP6N50FI	500 V	< 1.1 Ω	3.8 A

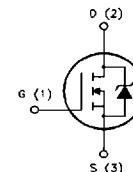
- TYPICAL R_{DS(on)} = 0.93 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP6N50	STP6N50FI	
V _{DS}	Drain-source Voltage (V _{GS} = 0)	500		V
V _{DGR}	Drain-gate Voltage (R _{GS} = 20 kΩ)	500		V
V _{GS}	Gate-source Voltage	± 20		V
I _D	Drain Current (continuous) at T _c = 25 °C	6	3.8	A
I _D	Drain Current (continuous) at T _c = 100 °C	3.8	2.4	A
I _{DM(*)}	Drain Current (pulsed)	24	24	A
P _{tot}	Total Dissipation at T _c = 25 °C	100	40	W
	Derating Factor	0.8	0.32	W/°C
V _{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T _{stg}	Storage Temperature	-65 to 150		°C
T _j	Max. Operating Junction Temperature	150		°C

(*) Pulse width limited by safe operating area

THERMAL DATA

			TO-200	ISOWATT220	
R _{thj-case}	Thermal Resistance Junction-case	Max	1.25	3.12	°C/W
R _{thj-amb}	Thermal Resistance Junction-ambient	Max	62.5		°C/W
R _{thc-sink}	Thermal Resistance Case-sink	Typ	0.5		°C/W
T _j	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T _j max, δ < 1%)	6	A
E _{AS}	Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V)	300	mJ
E _{AR}	Repetitive Avalanche Energy (pulse width limited by T _j max, δ < 1%)	7	mJ
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (T _c = 100 °C, pulse width limited by T _j max, δ < 1%)	3.8	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source Breakdown Voltage	I _D = 250 μA V _{GS} = 0	500			V
I _{DSS}	Zero Gate Voltage Drain Current (V _{GS} = 0)	V _{Ds} = Max Rating V _{Ds} = Max Rating × 0.8 T _c = 125 °C			250 1000	μA μA
I _{GSS}	Gate-body Leakage Current (V _{Ds} = 0)	V _{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} I _D = 250 μA	2	3	4	V
R _{D(on)}	Static Drain-source On Resistance	V _{GS} = 10V I _D = 3 A V _{GS} = 10V I _D = 3 A T _c = 100°C		0.93	1.1 2.2	Ω Ω
I _{D(on)}	On State Drain Current	V _{Ds} > I _{D(on)} × R _{D(on)max} V _{GS} = 10 V	6			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _f (*)	Forward Transconductance	V _{Ds} > I _{D(on)} × R _{D(on)max} I _D = 3 A	2.5	4.5		S
C _{iss} C _{oss} C _{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V _{Ds} = 25 V f = 1 MHz V _{GS} = 0		800 140 60	1100 190 80	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	$V_{DD} = 250 \text{ V}$ $I_D = 3 \text{ A}$ $R_G = 50 \Omega$ $V_{GS} = 10 \text{ V}$ (see test circuit, figure 3)		40 110	55 150	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 400 \text{ V}$ $I_D = 6 \text{ A}$ $R_G = 50 \Omega$ $V_{GS} = 10 \text{ V}$ (see test circuit, figure 5)		85		$\text{A}/\mu\text{s}$
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 400 \text{ V}$ $I_D = 6 \text{ A}$ $V_{GS} = 10 \text{ V}$		55 9 26	75	nC nC nC

SWITCHING OFF

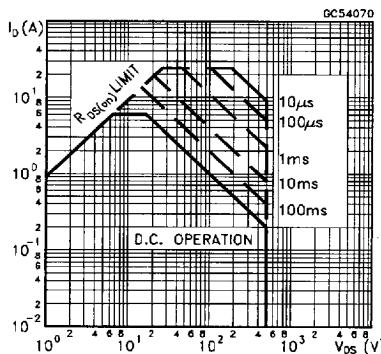
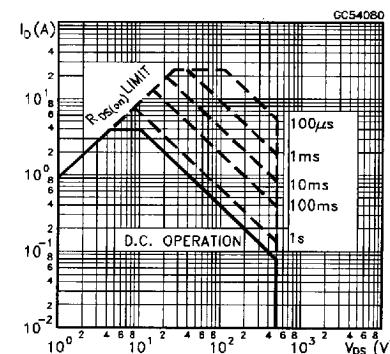
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Volt)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	$V_{DD} = 400 \text{ V}$ $I_D = 6 \text{ A}$ $R_G = 50 \Omega$ $V_{GS} = 10 \text{ V}$ (see test circuit, figure 5)		115 35 165	160 50 220	ns ns ns

SOURCE DRAIN DIODE

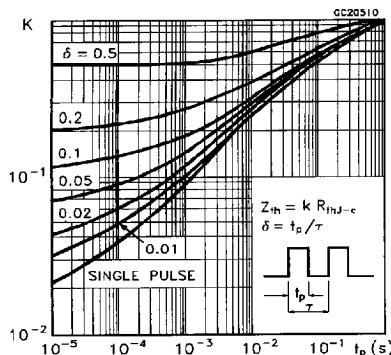
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM(\bullet)}$	Source-drain Current Source-drain Current (pulsed)				6 24	A A
$V_{SD} (\ast)$	Forward On Voltage	$I_{SD} = 6 \text{ A}$ $V_{GS} = 0$			1.6	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	$I_{SD} = 6 \text{ A}$ $di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 100 \text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, figure 5)		550 6.9		ns μC
I_{RRM}	Reverse Recovery Current			25		A

(*) Pulsed: Pulse duration $t^2 = 300 \mu\text{s}$, duty cycle 1.5 %

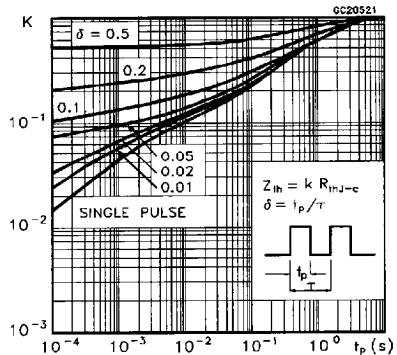
(*) Pulse width limited by safe operating area

Safe Operating Areas For TO-220**Safe Operating Areas For ISOWATT220**

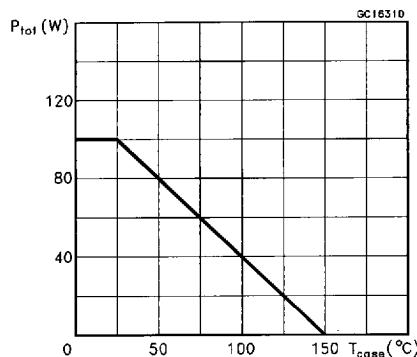
Thermal Impedance For TO-220



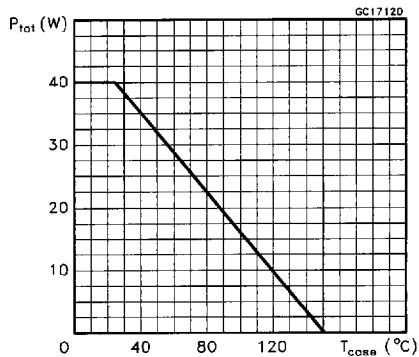
Thermal Impedance For ISOWATT220



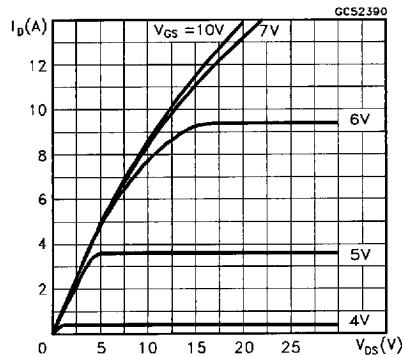
Derating Curve For TO-220



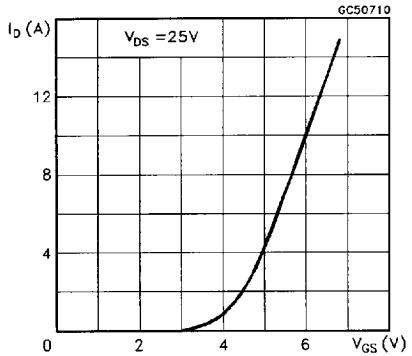
Derating Curve For ISOWATT220



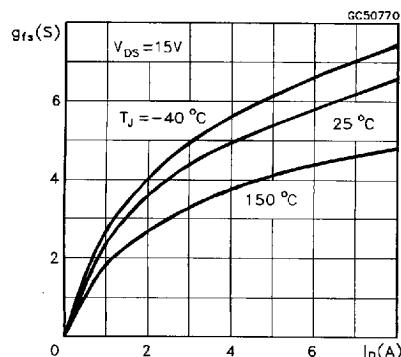
Output Characteristics



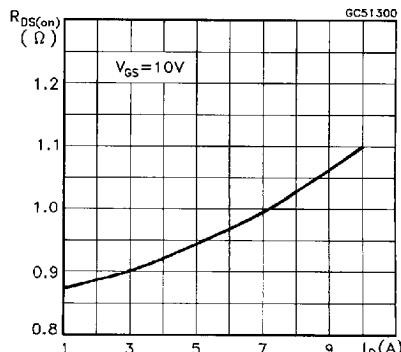
Transfer Characteristics



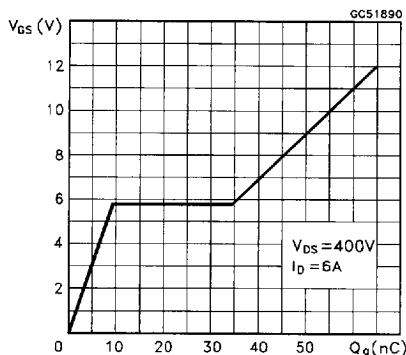
Transconductance



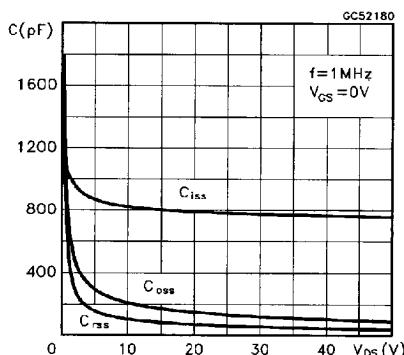
Static Drain-source On Resistance



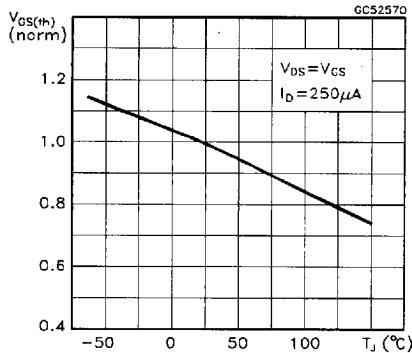
Gate Charge vs Gate-source Voltage



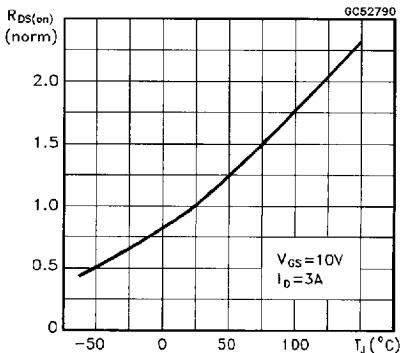
Capacitance Variations



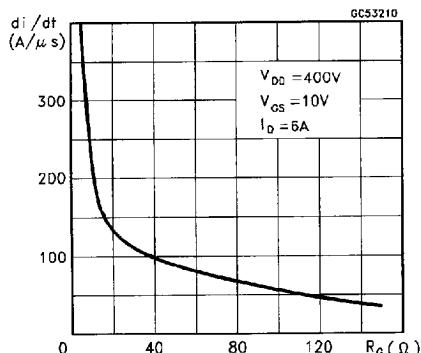
Normalized Gate Threshold Voltage vs Temperature



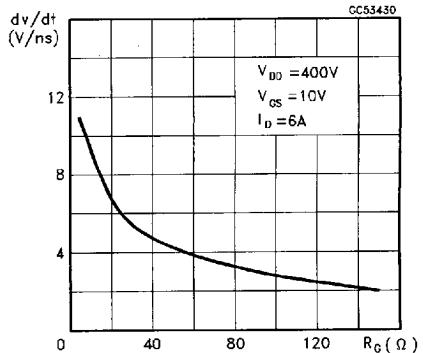
Normalized On Resistance vs Temperature



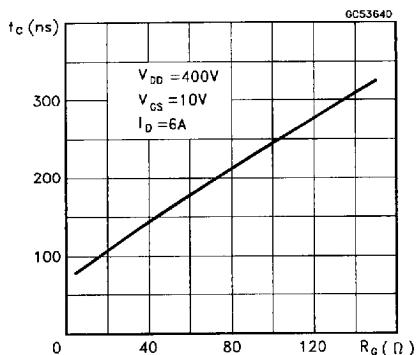
Turn-on Current Slope



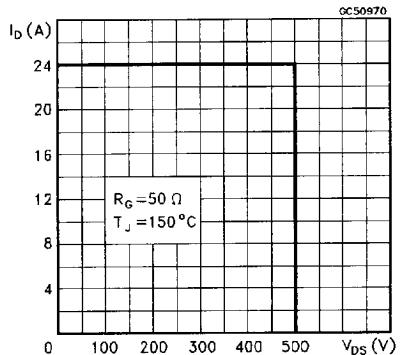
Turn-off Drain-source Voltage Slope



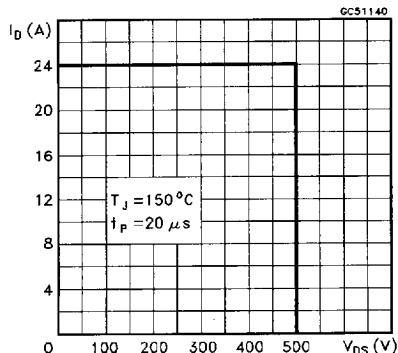
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

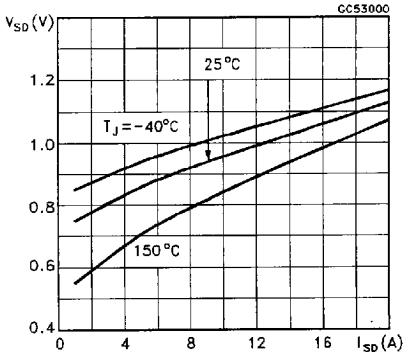
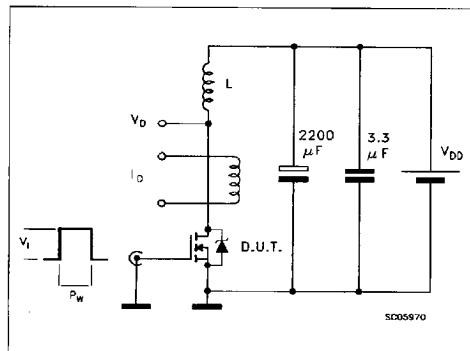
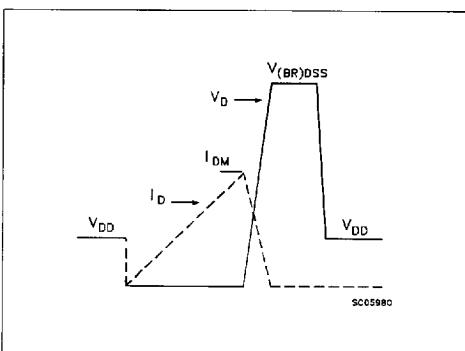
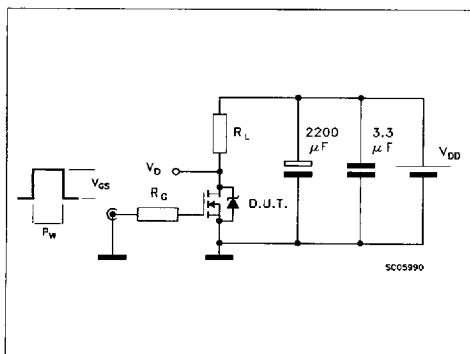
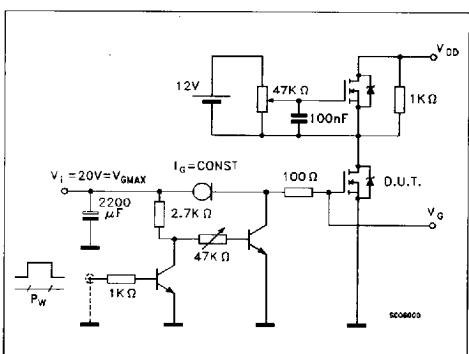


Fig. 1: Unclamped Inductive Load Test Circuits**Fig. 2:** Unclamped Inductive Waveforms**Fig. 3:** Switching Times Test Circuits For Resistive Load**Fig. 4:** Gate Charge Test Circuit**Fig. 5:** Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time